REMARKS

I. INTRODUCTION

In response to the Office Action dated April 13, 2004, claim 34 has been amended. Claims 1-41 remain in the application. Entry of these amendments, and re-consideration of the application, as amended, is requested.

II. CLAIM AMENDMENTS

Applicant's attorney has made amendments to claim 34 as indicated above. These amendments were made solely for the purpose of clarifying the language of the claims, and were not required for patentability or to distinguish the claims over the prior art.

III. SPECIFICATION OBJECTION

On page (2), paragraphs (1)-(2) of the Office Action, the Abstract was objected to as being too brief.

Applicant's attorney respectfully traverses this objection. The Abstract was amended in the previous response to overcome this rejection.

IV. NON ART REJECTION

On page (2), paragraphs (3)-(4) of the Office Action, claim 34 was rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Applicant's attorney has amended claim 34 to overcome this rejection.

V. PRIOR ART REJECTIONS

A. The Office Action Rejections

On page (3), paragraphs (1)-(2) of the Office Action, claims 1-41 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kahn et al., U.S. Patent No. 6,135,646 (Kahn) in view of Kawamura et al., U.S. Patent No. 5,778,388 (Kawamura).

Applicant's attorney respectfully traverses this rejection.

B. Applicant's Claimed Invention

Applicant's independent claims 1, 12, 23 and 34 are directed to a system, method, article of manufacture and data structure for assigning sequence numbers in a computer-implemented system. Claim 1 is representative, and comprises:

(a) a computer system; and

(b) sequence number assignment logic, performed by the computer system, for generating a recoverable, unique sequence number for assignment to an application, wherein the sequence number is contained in a control page stored in a database on a data storage device coupled to the computer system and shared with other computer systems, and updates to the control page are serialized across all of the computer systems.

C. The Kahn Reference

Kahn describes methods of managing digital objects in a network. Holders of rights in digital objects are enabled to control terms and conditions under which they are accessed by users in a network, or are granted to others.

D. The Kawamura Reference

Kawamura describes a database management method and a database management system in which transactions need not be stopped at a synchronization point (syncpoint) acquired at a fixed interval of time, when a point to acquire a syncpoint is reached in a database control procedure, a syncpoint acquisition start log is output and then a syncpoint acquisition flag is set ON in a page control table of each updated page existing in a buffer pool. In the operation, a list of update page control tables is also created to write in the database the pages which are indicated in the list thus prepared. However, for a transaction accessing the pertinent updated page prior to the write operation thereof in the database, the data write operation is performed before the page is referenced, thereby enabling the access to be performed to the database without interrupting the transaction.

E. Applicant's Claims Are Patentable Over The References

Applicant's independent claims 1, 12, 23 and 34 are patentable over the cited references because these claims include limitations not shown by the references.

However, the Office Action states the following:

2. Claims 1 - 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kahn et al (U.S. 6,135,646) in view of Kawamura et al (U.S. 5,778,388).

• As per claim 1 - 4, 12 - 15, 23 - 26, 34, Kahn et al (U.S. 6,135,646) discloses a computer implemented system for assigning sequence numbers, comprising:

- "A computer system" See Fig. 2, col. 5 lines 30 - 32.

- "An application" corresponds to the "digital object", which includes an "application and associated object" (See Fig. 9 element 64, col. 12 lines 17 - 19, Kahn). "Unique sequence number for assignment to an application" corresponds to the "handle" which is a concise unique identifier for a digital object (col. 6 lines 21 - 24). The handle includes a serial number (See Fig. 6), which is a "sequence number".

- "A sequence number assignment logic, performed by the computer system" See col. 7 lines 61 - 64. The object management system 32 includes software that creates and stores digital object, therefore, it must include logic to assign a sequence number (as shown in fig. 6) to an application (See Fig. 9 element 80).

- "The sequence number is contained in a control page stored in a database on a data storage device" See Fig. 2, element 54.

  ▪ "A control page" corresponds to the page that stored multiple sequence number that stored in "handle server 1042", in Fig. 1, and Fig. 2 element 58, col. 9 lines 2 – 5. Since the handle server can return a list of pointers associated with the handle, the handle server must contain "a page" that stored the sequence number and the pointer.

  ▪ "The management system" 54 corresponds to the "storage device".

- "A control page that contains a sequence number that has no restrictions on its size" (See Fig. 1 and 2). In particular:

  ▪ "Sequence number that has no restrictions on its size" See col. 10 line 55 - 57.

- "An identifier that is a user-defined value that identifies a use for the sequence number" corresponds to the "serial number" in Fig. 5 - 6.

- "A range value (N) that identifies a range of sequence number assignments" See Fig. 7, col. 11 lines 29 - 43.

- "Updates to the control page are serialized across all of the computer systems" Kahn teaches that the identifiers are generated by multiple authorities (col. 10, lines 59 - 60). Therefore, when a new record or identifier is generated, the "control page" must be update because the handles should be globally unique across the network (col. 10, line 50).

- "A starting sequence number (Starting SN) that comprises an initial value for the sequence number" See Fig. 7. The starting sequence number for handle server #1 is 0, for handle server 2 is k+1, and so on.

Kahn, however, does not clearly disclose that the unique sequence number is recoverable. Kahn teaches that the "handle" or "sequence number" should be globally unique across the network, and should be essentially permanent (col. 10 lines 50 - 51).

Kawamura, on the other hand, discloses a method of processing a synchronization point in a database management system. Kawamura teaches "a syncpoint acquiring part 26 for guaranteeing an operation to periodically set the databases to an integral state" (col. 5 lines 58 - 60, Kawamura). Kawamura also teaches "acquiring a synchronization point (syncpoint) in said database management system for enabling a plurality of transactions to be performed concurrently in which a restart recovery process is assumed at an occurrence of a system failure "see claim 6 of Kawamura

It would have been obvious to one with ordinary skill in the art at the time the invention was made to apply the teaching of Kawamura into the system of Kahn because the motivation is to improve the accuracy of databases, keep the databases up to date for other operations, and to make the handle recoverable.

Further, the Office Action asserts the following:

Response to Arguments

3. Applicant's arguments filed 03/15/2004 have been fully considered but they are not persuasive.

Applicant argues that the references do not teach or suggest storing the sequence numbers in a control page, wherein the control page is stored in a database on a data storage device coupled to the computer system and shred with other computer systems, and updates to the control page are serialized across all of the computer systems. The examiner respectfully disagrees.

Referring to Fig. 7, each handle server controls a range of sequence number such as 0 - k for handle server 1. As discussed above, the handle server must include a page that is able to store multiple sequence numbers. When a page that included in handle server, this handle server must include a storage device to store the page. Kahn teaches that the identifiers are generated by multiple authorities (col. 10, lines 59 - 60). Therefore, when a new record or identifier is generated within the range, the "control page" must be updated. The handles should be globally unique across the network (col. 10, line 50), therefore, the update to the control page are serialized across all of the computer systems.

Applicant's attorney disagrees. The combination of references does not teach or suggest Applicant's independent claims. Specifically, the references, taken individually or in combination, do not teach or suggest "generating a recoverable, unique sequence number for assignment to an application, wherein the sequence number is contained in a control page stored in a database on a data storage device coupled to the computer system and shared with other computer systems, and updates to the control page are serialized across all of the computer systems."

For example, the Office Action asserts that the "sequence number assignment logic, performed by the computer system," is taught by Kahn at col. 7 lines 61 - 64. The Office Action asserts that the object management system 32 of Kahn includes software that creates and stores

digital objects, and therefore, it must include logic to assign a sequence number, as shown in Fig. 6. However, these portions of Kahn merely describe the following:

> Kahn: col. 7, lines 61 - 64 (actually, lines 56-65)
> The handle management systems 54 are used to find the location of digital objects and the locations of each object's associated RMS [rights management system]. A handle for an object may be associated with zero or more object pointers. Object pointers contain location information for locating digital objects and/or associated RMSs. Each object may have an associated RMS which manages rights in the object on behalf of the rights holders.
> Handle generators 56 in the handle management systems 54 create the globally unique handles.

The above portions of Kahn do not teach or suggest "sequence number assignment logic, performed by the computer system." Instead, these portions of Kahn merely describe handle management, but nowhere does Kahn imply that the handles are sequential.

Note also that Kahn does not teach or suggest that the handle is a sequence number:

> Kahn: Col. 6, lines 21-24
> Each digital object has a "handle", a concise unique identifier for a digital object used for storage and retrieval operations and other repository functions.

> Kahn: Col. 11, lines 1-12
> The authorization and rules for creating a handle are determined on a country-by-country basis. As seen in FIG. 5, handles are printable strings 130, having a country code 132 appended to a variable length string defined on a per country basis 134.
> Within the United States, the variable length string will be generated in a form similar to a domain name within the Internet, FIG. 6. Authority zones will be established, and each zone authority will be able to assign handles directly or create subzone 140 authorities. A time stamp 142 and serial number 144 are used to create a unique identifier within an authority zone.

Again, the above portions of Kahn do not teach or suggest that "serial numbers" are "sequence numbers." Indeed, nowhere does Kahn describe how serial numbers are generated, and thus it is only with hindsight that the Office Action can assert that serial numbers are sequence numbers.

In another example, the Office Action asserts that "the sequence number is contained in a control page stored in a database on a data storage device," is taught by Kahn in Fig. 2, element 54, that "a control page" corresponds to the page that stored multiple sequence number that stored in "handle server 1042", in Fig. 1, and Fig. 2 element 58, col. 9 lines 2 - 5, and that since the handle

server can return a list of pointers associated with the handle, the handle server must contain "a page" that stored the sequence number and the pointer. The Office Action also asserts that "the management system" 54 corresponds to the "storage device," that "a control page that contains a sequence number that has no restrictions on its size," is taught by Kahn in Figs. 1 and 2, that a "sequence number that has no restrictions on its size," is taught by Kahn at col. 10 line 55 – 57, that "an identifier that is a user-defined value that identifies a use for the sequence number" corresponds to the "serial number" in Kahn in Figs. 5 - 6, and that "a range value (N) that identifies a range of sequence number assignments," is taught in Kahn in Fig. 7, and at col. 11 lines 29 - 43. However, these portions of Kahn merely describe the following:

> Kahn: col. 9 lines 2 – 5 (actually col. 8, line 66 – col. 9, line 10)
>
> Handle servers 58 process handle query requests. If the handle which is the subject of the query is found by a handle server, the object pointers associated with the handle are returned to the requesting client. A handle server accepts a handle as input and returns a list of pointers associated with the handle, where each pointer={domain name of storage system (repository), domain name of RMS}. The domain name of the RMS may be null, e.g., if there are no terms and conditions stored in the RMS. The domain name of the storage system may be null if the rights stored in the RMS do not include obtaining a copy of the object, or if the rights apply to a "physical" object.

> Kahn: col. 10, lines 55 - 57 (actually, lines 50-60)
>
> Handles should be globally unique across the network and over time; should be essentially permanent, since rights on an object may last many years; should not have any location information encoded in the identifier's namespace, since an object may be located at multiple and changing locations over time; the identifier's namespace must be variable and unrestricted, since the number of digital objects created may be expected to increase; once a user acquires an object's identifier, he should be able use the handle to ascertain the current location of the object; multiple authorities should be able to generate the identifiers.

> Kahn: col. 11, lines 29 - 43
>
> Handle servers have the following characteristics: a handle server holds pointers associated with a subset of all handles; handles are assigned to handle servers based upon hash values computed on the handles; handle servers are assigned ranges of hash values; the set of all hash values is partitioned among the set of all handle servers. This leads to a highly efficient and reliable mechanism for locating objects and from handles. Other less efficient or less reliable methods could also be used. Handle servers may be configured to broadcast requests for handles to other handles servers, further enhancing the reliability and effectiveness of the system.
>
> The handle server directory 59 holds a table 149 which associates hash ranges 150 with domain names of handle servers 58 (FIG. 7).

The above portions of Kahn do not teach or suggest that "the sequence number is contained in a control page stored in a database on a data storage device coupled to the computer system and shared with other computer systems, and updates to the control page are serialized across all of the computer systems." Instead, these portions of Kahn merely describe a handle management system and a handle server.

In another example, the Office Action admits that Kahn does not disclose that the unique sequence number is recoverable, but nonetheless asserts that Kahn teaches that the "handle" or "sequence number" should be globally unique across the network, and should be essentially permanent, at col. 10 lines 50 - 51.

> Kahn: col. 10, lines 55 - 57 (actually, lines 50-60)
> Handles should be globally unique across the network and over time; should be essentially permanent, since rights on an object may last many years; should not have any location information encoded in the identifier's namespace, since an object may be located at multiple and changing locations over time; the identifier's namespace must be variable and unrestricted, since the number of digital objects created may be expected to increase; once a user acquires an object's identifier, he should be able use the handle to ascertain the current location of the object; multiple authorities should be able to generate the identifiers.

The above portions of Kahn merely describe how the handles are globally unique and essentially permanent, but do not teach or suggest that the unique sequence number is recoverable, i.e., the sequence number is contained in a control page stored in a database on a data storage device coupled to the computer system and shared with other computer systems.

In another example, the Office Action asserts that Kawamura teaches a method of processing a synchronization point in a database management system, which relates to the limitation of Applicant's claims directed to the sequence number being "recoverable." The Office Action states that Kawamura teaches "a syncpoint acquiring part 26 for guaranteeing an operation to periodically set the databases to an integral state" (col. 5 lines 58 - 60, Kawamura). Kawamura also teaches "acquiring a synchronization point (syncpoint) in said database management system for enabling a plurality of transactions to be performed concurrently in which a restart recovery process is assumed at an occurrence of a system failure "see claim 6 of Kawamura. However, these portions of Kawamura merely describe the following:

Kawamura: col. 5 lines 58 – 60 (actually, lines col. 5, line 42 – col. 6, line 6)

The database management system 20 includes a query analyzing part 21 for receiving a database queny request in a structured query language (SQL) from a user, conducting an optimizing process through a syntactic analysis to determine an optimal access route for a database access, and generating an internal processing code for the processing of the database according to the determined access route, a database processing part 22 for accessing the database according to the internal processing code thus created, a buffer pool control part 23 for communicating data between the databases 36 (36a and 36b) stored in the external storages 16 and a buffer pool 34 reserved in the main storage 14, a transaction control part 24 for controlling transactions input from the terminals 18, a deferred write processing part 25 for writing the updated data of the buffer pool 34 in the database 36 in the external storage 16 in an asynchronous manner with respect to transactions, a syncpoint acquiring part 26 for guaranteeing an operation to periodically set the databases to an integral state, a logging part 27 for controlling a log including historical information of database update operations conducted for transactions (to be simply referred to as "log" herebelow), assigning a log sequence number (LSN) to each log record, and obtaining data from a log buffer 35 in the main storage 14 at termination of each transaction and thereby writing the data in the log file 37 in the external storage 16, and an output page control table list 38 (FIG. 12). The buffer pool control part 23 includes a buffer pool control table 31, a page control table 32, and a hash control table 33 for controlling the buffer pool 34 reserved in the main storage with correspondences established between the pool 34 and physically fixed-length pages as units of accumulation of data in the databases.

Kawamura: claim 6

6. A database system including a computer system having a central processing system (CPU) and a main storage, an external storage having a database and terminals, said computer system further including a database management system which comprises:

means for acquiring a synchronization point (syncpoint) in said database management system for enabling a plurality of transactions to be performed concurrently in which a restart recovery process is assumed at an occurrence of a system failure, said syncpoint assuring a database version on said external storage, said syncpoint being determined at each interval at which database update logs from the transactions are accumulated (incremented) to a given amount, said means comprising:

a buffer and page control tables,

an update page control table,

mark means for assigning, at the beginning of an acquisition of a syncpoint, a mark indicating that syncpoint acquisition is in process to tables controlling all updated pages in a buffer pool mapped onto said main storage, said buffer pool including a plurality of buffers for storing respective pages, said updated pages not having been written into a database of said external storage,

write means for writing, during the syncpoint acquisition, the updated pages for the marked table to the database of said external storage,

update and access control means for further updating specific ones of the updated pages for the marked tables during the syncpoint acquisition process, before

> the specific updated pages are accessed, writing the further updated specific pages to said database, removing the mark from the control table for the further updated specific pages to allow a request of access and to the further updated specific pages, and
>
> determining means for determining, in response to termination of a write operation of said database, that the syncpoint acquisition has been completed at the end of the write operation for all updated pages for the marked tables.

The above portions of Kawamura merely describe a database management system that synchronizes transactions therein, but nowhere does it describe a recoverable, unique sequence number used by sequence number assignment logic, wherein the sequence number is contained in a control page stored in a database on a data storage device coupled to the computer system and shared with other computer systems, and updates to the control page are serialized across all of the computer systems.

In another example, the Office Action asserts that Kahn teaches, in Fig. 7, that each handle server controls a range of sequence number such as 0 - k for handle server 1, that "the handle server must include a page that is able to store multiple sequence numbers," and that "when a page that included in handle server, this handle server must include a storage device to store the page." According to the Office Action, Kahn teaches that the identifiers are generated by multiple authorities, at col. 10, lines 59 - 60, and therefore, when a new record or identifier is generated within the range, the "control page" must be updated. The Office Action further asserts that handles should be globally unique across the network, as suggested by Kahn at col. 10, line 50, and therefore, the update to the control page are serialized across all of the computer systems. However, these portions of Kahn merely describe the following:

> Kahn: col. 10, lines 59-60 and line 50 (actually, lines 50-60)
>
> Handles should be globally unique across the network and over time; should be essentially permanent, since rights on an object may last many years; should not have any location information encoded in the identifier's namespace, since an object may be located at multiple and changing locations over time; the identifier's namespace must be variable and unrestricted, since the number of digital objects created may be expected to increase; once a user acquires an object's identifier, he should be able use the handle to ascertain the current location of the object; multiple authorities should be able to generate the identifiers.

The above portions of Kahn do not teach or suggest that the recoverable, unique sequence number is contained in a control page stored in a database on a data storage device coupled to the computer system and shared with other computer systems, or that updates to the control page are

serialized across all of the computer systems. Instead, these portions of Kahn merely describe how the handles are globally unique and essentially permanent.

Note also that the reference by Kahn to hash tables refers to a directory of previously assigned handles:

> Kahn: Col. 11, lines 13-43
>
> Handle generators create new handles on demand of object rights holders who wish to have handles assigned to objects.
>
> When an object is deposited in a repository, the repository contains a copy of the object plus identification of certain simple terms and conditions for a obtaining a copy of the object and using it. The rights management system contains non-simple (i.e., requiring additional negotiation) terms and conditions for obtaining a digital object and using it, and could also contain simple terms. The pointer to the repository may be null if the object is not available on-line. Certain objects may be required to be persistent for legal and other reasons. The pointer to the rights management system may be null if only simple terms and conditions contained in the repository (or null terms and conditions) govern the use of the object.
>
> Handle servers have the following characteristics: a handle server holds pointers associated with a subset of all handles; handles are assigned to handle servers based upon hash values computed on the handles; handle servers are assigned ranges of hash values; the set of all hash values is partitioned among the set of all handle servers. This leads to a highly efficient and reliable mechanism for locating objects and from handles. Other less efficient or less reliable methods could also be used. Handle servers may be configured to broadcast requests for handles to other handles servers, further enhancing the reliability and effectiveness of the system.
>
> The handle server directory 59 holds a table 149 which associates hash ranges 150 with domain names of handle servers 58 (FIG. 7).

The above portions of Kahn do not teach or suggest storing a recoverable, unique sequence number, which is used for sequence number assignment to applications, in a control page stored in a database on a data storage device coupled to the computer system, wherein the control page is shared with other computer systems, or that updates to the control page are serialized across all of the computer systems. Instead, these portions of Kahn merely describe how handles are stored after they have been assigned, so that associated objects can be located, and that the storage of handles is spread across multiple handle servers.

In view of all of these differences, it is asserted that references, taken individually or in combination, do not anticipate or render obvious Applicant's independent claims 1, 12, 23 and 34, because they fail to teach all the limitations found in these claims. Moreover, it is asserted that the various elements of the Applicant's claimed invention together provide operational advantages over

the cited references. In addition, it is asserted that Applicant's claimed invention solves problems not recognized by the cited references.

Thus, Applicant submits that independent claims 1, 12, 23, and 34 are allowable over Kahn and Kawamura . Further, dependent claims 2-11, 13-22, 24-33, and 35-41 are submitted to be allowable over Kahn and Kawamura in the same manner, because they are dependent on independent claims 1, 12, 23, and 34, respectively, and thus contain all the limitations of the independent claims. In addition, dependent claims 2-11, 13-22, 24-33, and 35-41 recite additional novel elements not shown by Kahn and Kawamura.

VI. CONCLUSION

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicant's undersigned attorney.

Respectfully submitted,

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